STUDIES OF ANGIOSTRONGYLUS CANTONENSIS AND A MALAYSIENSIS OF RODENTS HOSTS IN TWO TRANSMIGRATION SCHEMES IN SOUTH SUMATERA

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Pada Tahun 1977 telah dilakukan survey zoonosis di dua daerah transmigrasi Baturaja-Martapura, Propinsi Sumatera Selatan dan Mulyoredjo, Way Abung III, Propinsi Lampung. Survey dilakukan oleh Badan Penelitian dan Pengembangan Kesehatan bersama WHO Vector and Rodent Control Research Unit di Jakarta dengan tujuan untuk mempelajari vector penyakit zoonosis yang ada di kedua daerah transmigrasi tersebut. Survey dilakukan dengan mengadakan penangkapan tikus di rumah dan di luar rumah, kemudian diadakan pemeriksaan identifikasi, pembedahan dengan peralatan laboratorium di daerah survey. Pada survey ini ditemukan 4 species tikus R. tiomaicus, R. argentivener, R. exulans dan R.r.diardii yang ternyata mendapat infeksi cacing Angiostrongylus. Infeksi tertinggi pada R. tiomanicus dan infeksi terendah pada R. r. diardii. Infeksi campuran A. cantonensis dan A. malaysiensis ditemukan pada R. tiomanicus dan R.r. diardii. Adanya A. cantonensis dan A. malaysiensis di kedua daerah transmigrasi adalah penemuan yang baru untuk di daerah Sumatra Selatan. R. argentiventer merupakan hospes baru untuk daerah Sumatra.

During multidisciplinary studies on rodents and mosquitoes in two transmigration schemes in South Sumatera to investigate the vectors of zoonotic diseases by personnel of the National Institute of Health Research and Development and WHO Vector and Rodent Control Research Unit, Jakarta, opportunity was also taken to examine the presence of the rat lung-worm in house and field rats. The rat lung-worm, *Angiostrongylus cantonensis*, anda aetiologic agent of human eosinophilic meningoencephalitis (Rosen, *et al* 1962) is widely distributed in the South Pacific (Rosen *et al* 1967) and Southeast Asia (Punyagupta *et al* 1975; Jindrak & Alicata, 1965; Watt, 1969). In Indonesia, eosinophilic meningitis was reported in 8 patients at Kisarian, East Sumatera in 1954-1957 by Smit (1962). Furthermore, Kwo & Kwo (1968) recovered adult worms of *A.cantonensis* form house and field rats, *Rattus r.diardii* and *R. jalorensis* (= *tiomanicus*] from Kisarian north of Medan. This constitutes the first authenicated report of this parasite in North Sumatera. Stafford et, al. (1976) also reported *A. cantonensis* in *R.r. diardii* in Medan. In South Sumatera, the same authors found the parasite in *R.r. diardii, R. tiomanicus* and *R. exulans* at Lubuk Linggau, Baturaja and Way Abung III. They also found mixed-infections of *A. cantonensis* and *A. malaysiensis* in these species of rats.

The present finding of *A. cantonensis* and *A. malaysiensis* in naturally infected

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house and field rats in Baturaja Martapura and Mulyorejo, Way Abung III transmigration schemes, are additional locality records of these parasites in South Sumatera.

MATERIALS AND METHODS

Rats were collected from Baturaja Martapura and Mulyorejo, Way Abung III transmigration schemes in the Provinces of Sumatera Selatan and Lampung in South Sumatera. The rats were trapped in both houses and surrounding cultivated fields in both these areas.

The animals were processed in the field laboratory. They were killed with chloroform. Ecto and endoparasites were recovered from every rat examined. The ectoparasites were preserved in 75 percent alcohol and endoparasites particularly, *Angiostrongylus* worms recovered from the lungs and heart of infected rats, were preserved in 70 percent glycerine alcohol.

The *Angiostrongylus* worms were cleared in lactophenol for 48 hours before they were examined under a compound microscope. Measurements were made by ocular micrometer. Statistical analyses were made in samples of more than 1o worms *A. cantonensis* and arithmetrical means were taken on samples less than 10 worms *A.malaysiensis*.

RESULTS

Fifteen of 64 rodents from Baturaja Martapura and five of 77 rodents from Mulyorejo, were positive for *A. cantonensis* and *A.malaysiensis* (Table 1). Every species of rodent from both localities was infected. The infection rate was higher in Baturaja Martapura than Mulyorejo.

Table 1 Natural infection with *Angiostrongylus cantonensis* and *A. malaysiensis* in house and field rats from Baturaja Martapura and Mulyorejo, Way Abung III Transmigration Schemes in South Sumatera.

Animal species	No. examined	No. infected	Angiostrongylus species								
			A. cantonensis					*A. malaysiensis*			
			percent % positive	Total no. *of worms* M	F	Mean no. of worms per infected animal	Range	Total no. *of worms* M	F	Mean no. per infected animal	Range
BATURAJA MARTAPURA											
Rattus tiomanicus	24	11	45.8	8	17	2.3	2-7	2	5*	3.5	3-4
Rattus exulans	3	1	33.3	1	1	-	-	-	-	-	
Rattus argentiventer	2	1	50.0	2	5	-		-	-	-	
Rattus rattus diardii	35	2	5.7	2	5	3.5	2-5	1	2**	-	
MULYOREJO, WAY ABUNG III											
Rattus rattus diardii	66	2	3.0	2	7	4.5	3-6	-	-	-	
Rattus tiomanicus	7	2	28.6	2	9	5.5	4-7	-	-	-	
Rattus exulans	4	1	25.0	1	2	-		-	-		

* Mixed infections (2*R. tiomanicus*) ** Mixed infections (1 *R.r. diardii*)

The overall infection rates were found to be highest in *R. tiomanicus* and lowest in *R.r.diardii* being 41.9 percent (13/31) and 3.9 percent (4/101) with a mean worm-load per infected animal of 2.8 as compared to 4.8 respectively. Mixed infections of *A.cantonensis* and *A malaysiensis* were found in two of the infected *R. tiomanicus* and one the *R.r.diardii* from Baturaja Martapura.Table2 shows the comparative measurements of

A. cantonensis and *A. malaysiensis* and the differences are as follows:

Male: The length of the *A. cantonensis* was found to be longer than that of *A. malaysiensis* and so was the spicule length. The separation of the ventro-ventral and the latero-ventral ray from the main trunk in *A.cantonensis* averaged 31.4 percent as compared to 54.4 percent in that of *A.malaysiensis*. There were not much differences in the measurements of other morphological characters observed between the two species.

Female : The length and width of *A. cantonensis* were found to be markedly longer and wider than that of *A.malaysiensis*, and so was that of the vagina length. The projection at the posterior end of the worm was absent in *A.cantonensis* but present in *A. malaysiensis*. Not much diefferences in the other characters were observed.

Table 2. Comparison of mean measurements ($\bar{X} \pm SD$) between adult worms of *Angiostrongylus cantonensis* and *A. malaysiensis*.

Characteristics of female worms	*A. cantonensis* 46 specimens		*A. malaysiensis* 7 specimens	
	$\bar{X} \pm$ SD	Range	Mean	Range
Length	23.4 ± 3.8	18 — 31	21.3	19 — 26
Width	0.41 ± 0.05	0.39 — 0.42	0.34	0.29 — 0.36
Es. length	0.31 ± 0.03	0.27 — 0.33	0.31	0.27 — 0.33
Es. width	0.04 ± 0.08	0.03 — 0.08	0.04	0.03 — 0.05
Vulva length	0.17 ± 0.02	0.13 — 0.20	0.17	0.14 — 0.20
Anung length	0.05 ± 0.02	0.03 — 0.08	0.05	0.03 — 0.06
Vagina length	2.35 ± 0.53	1.53 — 2.48	1.31	1.11 — 1.57
Characteristics of male worms	18 specimens		3 specimens	
	$\bar{X} \pm$ S.D.	Range	Mean	Range
Length	19.5 ± 1.4	16 — 22	18.7	15 — 21
Width	0.32 ± 0.03	0.29 — 0.38	0.28	0.18 — 0.32
Es. Length	0.33 ± 0.03	0.30 — 0.38	0.29	0.25 — 0.35
Es. Width	0.06 ± 0.03	0.05 — 0.08	0.04	0.03 — 0.06
Spicule length	1.28 ± 0.07	1.08 — 1.41	1.05	0.88 — 1.11
Separation between v.v./l.v. ray.	31.4%	25.7 — 35%	54.4%	51.2 — 53.8%

v.v. ventro-ventral; l.v. = latero-ventral; Es = esophagus.

DISCUSSION

The result of this survey revealed new locality record of *A. cantonensis* and *A. malaysiensis* in rodent hosts in South Sumatera and, in addition, *R. argentiventer* constitutes a new host record for Sumatera.

Statistical analyses in the morphology of *A. cantonensis* show differences in certain characteristic features in both male and female worms from that of *A. malaysiensis* as mentioned in the preceding text. Kwo & Kwo(1968) found 38.5 percent (5/13) *R.tiomanicus* and 55.6 percent (10/18) *R.r.diardii*

in the suburbs of Medan, but none of the 62 *R.r.diardii* from houses was infected. Stafford *et al.* (1976) found 4.7 percent (2/42) *R.r. diardii* in Medan infected with *A.cantonensis* and *A. malaysiensis*, but no mention was made whether these rats were trapped either in houses or in the fields. In South Sumatera they also found 3.1 percent (1/32) *R.r. diardii* from Baturaja and 2.2. percent(1/44) *R.r.diardii* from Way Abung III infected with both the parasites. They examined a single *R.tiomanicus* from Baturaja and from Way Abung III they found 55.6 percent (5/9) *R.tiomanicus* and 15.3 percent (2/13) *R. exulans* were also infected with these parasites.

The high infection rate in *R. tiomanicus* and the low rate in *R.r.diardii* in the present survey in the two transmigration schemes appear to agree with the findings of Stafford et, al. (1976) but differ with Kwo & Kwo (1968) in the infection rate of *R.r.diardii*. The latter authors also found high worm-load in both *R.r.diardii* and *R.tiomanicus* with an average of 11 and 16 worms per infected rat respectively.

No mention was made of the worm-load in infected animals studied by Stafford et. al (1976) However, the low infection rate in *R.r.diardii* and the low worm-load in borth *R.r.diardii* and *R.tiomanicus* in the present survey are probably due to the low density of natural infection of the intermediate hosts present in the areas.

Stafford et al (1976) reported mixed-infections of *A. cantonensis* and *A.malaysiensis* in the single *R.r.diardii* at Baturaja and in Way Abung III they found 50 percent and 80 percent of the *R. exulans* and *R. tiomanicus* with mixed-infections. The present observations of mixed-infections of both the parasites in two *R. tiomanicus* and one *R.r.diardii* support the findings of Stafford et al (1976). *A. malaysiensis* was described by Bhaibulaya and Cross in 1971. Prior to that period all rat lung-worms of the genus *Angiostrongylus* found in rodents in South east Asia were known as *A.cantonensis*. In view of the high percentage of mixed-infections of these parasites in rodents in Sumatera found by Stafford et al (1976) and also in the present observations, it is therefore, quite possible that *A. cantonensis* reported by Kwo & Kwo (1968) in rodents in Medan may contain mixed-infections of both parasites.

Investigations by various workers (Margono, 1970; Margono & Illahude,, 1974; Carney et. al.1974; Wiroreno, 1975; Stafford **et, al.** 1976) have not yielded mixed-infections from infected rodents in Java. However, *A.malaysiensis* was isolated from a pool of *Achatina-fulica*, one of the intermediate hosts of the parasite (Stafford et al. 1976) at Semarang on the north coast of Central Java by Carney et al. (1974). The presence of this parasite in *A.fulica* suggests that this worm may be also found in feral rats from Java as *A.fulica* and other molluscs have been found to be part of the food diet of house and field rats in Malaysia by Lim (1966).

The mode of rodent infection with the parasite is by direct digestion of the intermediate molluscan or paratenic hosts (Lim & Heyneman. 1965). Thus, the finding of *A.cantonensis* and *A.malaysiensis* in house and field rats in the present survey confirmed that snails are part of the food diet of these rats, particularly the field rats, *R. tiomanucus*, *R. argentiventer* and *R. exulans*, and to a lesser extent the house rat, *R.r.diardii*. These parasitological evidences further support the field and laboratory experiments of molluscs being a component of the food habit among the fields rats by Lim (1966)

A. cantonensis has been implicated as the cause of eosinophilic meningitis in man in Sumatera by Smit (1962) and recently the parasite was reported in the eye of a patient in Semarang from Central Java by Widagdo et al. (1977). The latter case report constitutes the first authenticated record of this parasite found in man in Indonesia. However, in view of the presence of *A.malaysiensis* in rodent hosts in Sumatera and the evidence of this parasite in the intermediate host, *A. fulica* in Java, the probability of this species being pathogenic to man should also be considered.

In conclusion, the result of this survey revealed that the life-cycle of *A. cantonensis*

and *A. malaysiensis* are maintained in the house and field rats in both the transmigration schemes. Although no effort was made to look for the molluscan intermediate hosts, the fact that house and field rats were found to be infected with these parasites, is indicative that the intermediate molluscan hosts are present in the areas. Heyneman & Lim (1967) have demonstrated that some of the intermediate molluscan hosts of *A. cantonensis* (=*malaysiensis*) in Malaysia shed infective larvae onto the vegetables, particularly lettuce. Thus, it may be assumed that similar situation might occur in some of the intermediate molluscan hosts that are likely to shed infective larvae on leaves of vegetables as well as on leaves of tapioca and papaya trees. The latter two greens are consumed in large quantities in one of the schemes we visited. Palatibility of these greens depends greatly on the degree of cooking; the less cooked provides a more palatable taste. *Angiostrongylus* larvae have been known to be viable to infection under certain degree of temperature. Thus, there is a potential risk of human infections through eating half-cooked food and drinking water contaminated with the parasites is possible.

SUMMARY

Four species of rodents, *R. tiomanicus*, *R. argentiventer*, *R. exulans* and *R.r. diardii* examined from Baturaja Martapura and Mulyorejo, Way Abung III transmigration scheme were found to be naturally infected with *Angiostrongylus* worms. *R. tiomanicus* was found to have the highest infection rate wth the lowest in *R.r. diardii.*

Mixed-infections of *A. cantonensis* and *A. malaysiensis* were observed in *R. tiomanicus* and *R.r. diardii.* The natural infection with these parasites in rodent hosts in relation to their food habits is discussed. The presence of these parasites in rodent hosts from these two transmigration schemes are new locality records of *A.cantonensis* and *A.malaysiensis* in South Sumatera. *R. argetiventer* constitutes a new host record of the parasite for Sumatera.

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